

1. An air handler for positioning below a melt spinning apparatus configured to discharge filaments of material onto a collector moving in a machine direction and collecting air discharged from the melt spinning apparatus, said air handler comprising:

5 an outer housing having first walls defining a first interior space, one of said first walls having an intake opening positioned below the collector for admitting the discharged air into said first interior space and another of said first walls having an exhaust opening for exhausting the discharged air;

an inner housing positioned within said first interior space and having  
10 second walls defining a second interior space coupled in fluid communication with said exhaust opening in said outer housing, one of said second walls of said inner housing having an elongate slot with a major dimension extending in a cross-machine direction, said elongate slot coupling said first interior space in fluid communication with said second interior space; and

15 a first adjustable flow control device positioned in said first interior space, said first flow control device operative for controlling the flow of the discharged air between said first interior space and said second interior space.

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2. The air handler of claim 1, wherein said first interior space includes a flow chamber and a first plenum extending between an air inlet port coupled in fluid communication with said flow chamber and said aperture, said flow chamber positioned between said intake opening and said inner housing, and said first  
5 adjustable flow control device positioned proximate to said air inlet port of said first plenum for controlling the flow of discharged air from said flow chamber through said air inlet port into said first plenum.
3. The air handler of claim 2, wherein said first interior space includes a second plenum extending between said flow chamber and said aperture, said second plenum fluidically isolated from said first plenum.
4. The air handler of claim 3, further comprising a second adjustable flow control device positioned in said first interior space, said second flow control device operative for controlling the flow of discharged air between said first interior space and said second interior space.
5. The air handler of claim 3, said second adjustable flow control device is positioned proximate to said air inlet port of said second plenum for controlling the flow of discharged air from said flow chamber through said air inlet port into said second plenum.

6. The air handler of claim 1, further comprising an air-directing member positioned outside of said first interior space proximate to said intake opening, said air-directing member extending in a cross-machine direction and dividing said intake opening into first and second portions in the machine direction.

7. The air handler of claim 6, wherein said air-directing member is a first roller having a rolling contact with said collector.

8. The air handler of claim 7, further comprising a second roller positioned generally inside of said first interior space and proximate to said intake opening, said second roller positioned relative to said first roller such that at least the collector is captured with a rolling engagement between said first and said

5 second rollers.

9. An air handler for positioning below a melt spinning apparatus configured to discharge filaments of material onto a collector moving in a machine direction and collecting air discharged from the melt spinning apparatus, said air handler comprising:

5 an outer housing having first walls defining a first interior space, one of said first walls having an intake opening positioned below the collector for admitting the discharged air into said first interior space and another of said first walls having an exhaust opening for exhausting the discharged air;

an inner housing positioned within said first interior space and having  
10 second walls defining a second interior space coupled in fluid communication with said exhaust opening in said outer housing, one of said second walls of said inner housing having an elongate slot with a major dimension extending in cross-machine direction, said elongate slot coupling said first interior space in fluid communication with said second interior space; and

15 an air-directing member positioned outside of said first interior space proximate to said intake opening, said air-directing member extending in a cross-machine direction and dividing said intake opening into first and second portions in the machine direction.

10. The air handler of claim 9, wherein said air-directing member is a first roller having a rolling contact with said collector.

11. The air handler of claim 10, further comprising a second roller positioned generally inside of said first interior space and proximate to said intake opening, said second roller positioned relative to said first roller such that the collector is captured with a rolling engagement between said first and said second rollers.

12. The air handler of claim 10, further comprising a forming chamber at least partially surrounding said intake opening and said roller, said forming chamber providing a process space between the melt spinning assembly and the collector for the passage of filaments of material to the collector, and said first  
5 portion of the intake opening positioned inside said forming chamber and said second portion of said intake opening positioned outside of said forming chamber.

13. The air handler of claim 11, wherein said forming chamber further comprises a perforated metering sheet for regulating the flow of discharge air from the environment surrounding said forming chamber into said process space.

14. The air handler of claim 9, further comprising a flow control device positioned in said first interior space, said flow control device operative for controlling the flow of air between said first interior space and said second interior space.

15. A system for depositing a spunbond layer on a collector moving in a machine direction, comprising:

a melt spinning apparatus operative to extrude filaments of material, said melt spinning apparatus positioned vertically above the collector; and

5 an air management operative to collect air discharged from the melt spinning apparatus, said air handler comprising:

a first air handler positioned directly below said melt spinning apparatus in a forming zone, a second air handler being positioned upstream of the second air handler and the forming zone, and a third air handler being positioned downstream of the second air handler and the forming zone, each of said air handlers including:

an outer housing having first walls defining a first interior space, one of said first walls having an intake opening positioned below the collector for admitting the discharged air into said first interior space and another of said first walls having an exhaust opening for exhausting the discharged air; and

an inner housing positioned within said first interior space and having second walls defining a second interior space coupled in fluid communication with said exhaust opening in said outer housing, one of said second walls of said inner housing having an elongate slot with a major dimension extending in cross-machine direction, said elongate slot coupling said first interior space in fluid communication with said second interior space; and

said second and third air handlers each including:

an air-directing member positioned outside of said first interior space proximate to a corresponding one of said intake openings, said air-directing member extending in a cross-machine direction and dividing said corresponding one of said intake openings into first and second portions in the machine direction; and

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an adjustable flow control device positioned in said first interior space, said first flow control device operative for controlling the flow of the discharged air between said first interior space and said second interior space.

16. The system of claim 15, further comprising a filament drawing device positioned vertically between said melt spinning apparatus and the collector, said filament drawing device operative for providing an air flow sufficient to attenuate the filaments of material.

17. The system of claim 16, further comprising a quench system positioned between said melt spinning apparatus and said filament drawing device, said quench system operative for providing a flow of quenching air to cool the filaments of material extruded from said melt spinning apparatus.

18. The system of claim 15, further comprising a forming chamber at least partially surrounding said intake openings and said air-directing members, said enclosure defining a process space positioned between the melt spinning assembly and the collector for the passage of filaments of material to the  
5 collector.

19. The system of claim 18, wherein said forming chamber further comprises a perforated metering sheet for regulating the flow of air from the ambient environment surrounding said forming chamber into said process space.

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20. A apparatus configured to discharge filaments of material onto a collector moving in a machine direction, comprising:

a melt spinning apparatus operative for extruding filaments of material;

a filament drawing device positioned between said melt spinning

5 apparatus and the collector, said filament drawing device having an inlet for receiving the filaments of material from said melt spinning apparatus and an outlet for discharging said filaments of material toward the collector, said filament drawing device operative for providing a flow of process air sufficient to attenuate the filaments of material and the flow of process air entraining  
10 secondary air from the ambient environment between said outlet and the collector;

an air handler having an intake opening positioned proximate to the collector, said air handler collecting process air discharged from said filament drawing device and entrained secondary air through said intake opening; and

15 a forming chamber having a side wall at least partially surrounding said intake opening of said air handler and said outlet of said filament drawing device, an entrance opening downstream of the intake opening, and an exit opening upstream of the intake opening, said side wall defining a process space for the passage of the filaments of material from said outlet of said filament  
20 drawing device to the collector and partitioning said process space from the surrounding ambient environment and said entrance and exit openings dimensioned so that at least the collector can traverse said process space, and said side wall of said forming chamber including a perforated metering sheet configured to regulate the flow of air from the ambient environment into said  
25 process space.

21. The system of claim 20, further comprising a quench system positioned between said melt spinning apparatus and said filament drawing device, said quench system operative for providing a flow of quenching air to cool the filaments of material extruded from said melt spinning apparatus.

22. The air handler of claim 20, further comprising a first air-directing member positioned downstream of said intake opening, said first air-directing member extending in a cross-machine direction and spaced from said intake opening so as to provide said entrance opening.

24. The air handler of claim 22, further comprising a second air-directing member positioned upstream of said intake opening, said second air-directing member extending in a cross-machine direction and spaced from said intake opening so as to provide said exit opening.

25. A method for depositing a nonwoven web of filaments of material on a collector moving in a machine direction, comprising:

extruding filaments of material from a melt spinning assembly;

mixing the filaments of material with a flow of process air;

5 depositing the filaments of material on the collector; and

collecting the process air with an intake opening of an air management system having a substantially uniform collection of the process air in a cross-machine direction and a selectively variable ratio of air flow velocity in the machine direction to air flow velocity in the machine direction.

26. The method of claim 25, wherein the ratio of air flow velocity in the machine direction to air flow velocity in the cross-machine direction orthogonal provides a ratio of filament alignment in the machine direction relative to filament alignment in the cross-machine direction, and the collecting step further  
5 comprises:

adjusting the air flow velocity in the machine direction to provide the ratio of filament alignment in the machine direction relative to filament alignment in the cross-machine direction.

27. The method of claim 25, further comprising varying the air flow velocity in the machine direction to provide filament alignment in the machine direction relative to filament alignment in the cross-machine direction that ranges from a first ratio of about 5:1 to a second ratio of about 1 to 1.

28. The method of claim 25, wherein the intake opening of the air management system includes a forming zone, an upstream zone upstream from the forming zone in the machine direction, and a downstream zone downstream from the forming zone in the machine direction, and the collecting step further  
5 includes:

applying a first negative pressure to the forming zone;  
applying a second negative pressure to the upstream zone; and  
applying a third negative pressure to the downstream zone.

29. The method of claim 28, further comprising varying at least one of the second negative pressure and the third negative pressure to change the air collection in the machine direction.

30. The method of claim 28, further comprising:  
sensing values for the second and third negative pressures; and  
controlling the second and third negative pressures according to the values sensed.

31. The method of claim 30, wherein the controlling step further comprises changing the relative positions of adjustable flow control devices.

32. The method of claim 25, further comprising substantially enclosing the intake opening with a forming chamber.

33. The method of claim 32, further comprising regulating the flow of secondary air into the forming chamber from the ambient environment surrounding the forming chamber.

34. The method of claim 25, wherein the collecting step includes controlling the air flow velocity in the cross-machine direction to provide a uniformity of less than about 5.0%.

35. The method of claim 25, wherein the mixing step further comprises directing a flow of process air in the direction of motion of the filaments of material to thereby attenuate the filaments of material.

36. The method of claim 35, wherein the directing step further includes accelerating the filaments of material with the flow of process air to a linear velocity greater than 8000 meters per minute.

37. The method of claim 35, wherein the flow of process air is provided by a filament drawing device having an exit aperture with at least first and second vertical spacings relative to the collector, and further comprising:

adjusting the vertical spacing between the exit aperture and the collector  
5 from the first vertical spacing to the second vertical spacing.

38. The method of claim 36, wherein the mixing step further comprises providing a flow of process air between the melt spinning assembly and the filament drawing device for quenching the extruding filaments of material.

39. The method of claim 25, wherein the mixing step further comprises providing a flow of process air between the melt spinning assembly and the filament drawing device for quenching the extruding filaments of material before the step of directing.